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Numerical and Experimental Study on Bed-Wall Heat Transfer in Conical Fluidized Bed Combustor

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Abstract : In this study the flow characteristics and bed-to-wall heat transfer in a gas-solid conical fluidized bed combustor were investigated using both experimental and numerical methods. The computational fluid dynamic (CFD) simulations were carried out using a commercial software, Fluent V6.3. A two-fluid Eulerian-Eulerian model was applied in order to simulate the gas–solid flow and heat transfer in a conical sand-air bed with 30o con angle and 22 cm static bed height. Effect of different fluidizing number varying in the range of 1.5 - 2.3, drag models namely (Syamlal-O'Brien and Gidaspow), and friction viscosity on flow and bed-to-wall heat transfer were analyzed. Both bed pressure drop and heat transfer coefficient increased with increasing inlet gas velocity. The Gidaspow drag model showed a better agreement with experimental results than other drag model. The friction viscosity had no clear effect on both hydrodynamics and heat transfer.

Keywords : computational fluid dynamics, heat transfer coefficient, hydrodynamics, renewable energy
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